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ART. XXXIX. — *Brief Contributions to Zoölogy from the Museum of Yale College.* No. XXVIII. *Results of recent Dredging Expeditions on the Coast of New England.* No. 6; by A. E. VERRILL.

[Continued from vol. vii, page 138.]

BY the coöperation of Professor Benjamin Peirce, Superintendent of the U. S. Coast Survey, the steamer Bache was detailed, during the month of September, to continue the researches of the U. S. Fish Commission, in the deeper waters off the coast, between Mt. Desert, Maine, and Cape Cod. Dr. A. S. Packard and Mr. Caleb Cooke, of Salem, Mass., kindly volunteered to take charge of the dredging operations on the Bache, and made several very successful cruises, bringing back large collections of the Invertebrata of those waters, among which were many arctic forms that were previously unknown on the American coasts. Their collections are particularly rich in those species that inhabit the muddy bottoms that prevail almost everywhere over the deeper parts of the Gulf of Maine, in 50 to 150 fathoms. They also obtained a large collection, of great interest, on the hard bottom, near Cashe's Ledge, in 52 to 90 fathoms. At this place many of the most interesting additions to the American fauna were obtained. Among these were several living specimens of *Anachis Haliæeti* (Jeffreys, as *Columbella*), *Archaster Parelii*, *Antedon Sarsii*, many fine Sponges, etc. Their dredgings may be conveniently grouped as follows:

1. *Muddy Bottoms.*

a.—A series from the muddy bottoms off the coast of Maine, from south of Manheigan Island to nearly south of Mt. Desert, including Jeffrey's Bank and its vicinity, and extending 60 to 65 miles from the coast-line, and covering a region of about 50 miles east and west, in depths ranging from 52 to 118 fathoms. In the following table the dredgings numbered 1 to 18, 22, 23, belong to this region.

b.—Several dredgings made on muddy bottoms in the deep waters near Jeffrey's Ledge, both on the east and west sides of it. (See numbers 20, 24, 24[a].)

c.—Two collections of much interest obtained from the deepest waters off the mouth of Massachusetts Bay, 20 to 24 miles northeast from the extremity of Cape Cod, in 117 and 142 fathoms, soft mud. (See numbers 36 and 37.)

d.—Two dredgings made in the central parts of Massachu setts Bay, on muddy bottoms, in 50 and 56 fathoms.

2. *Hard Bottoms.*

a.—A large collection from 52 to 90 fathoms, near Cashe's Ledge, situated about 90 miles south from the mouth of the Penobscot River. (Number 21.)

b.—Several lots from Jeffrey's Ledge, 6 to 14 miles northeast from Cape Ann, in 24–33 fathoms. (Numbers 27–29.)

c.—A large collection from Stellwagen's Bank, situated in Massachusetts Bay, north of Cape Cod, in 22 to 44 fathoms. (Numbers 32–35.)

3. *Inshore, mixed bottoms.*

a.—A small collection made, in 6 fathoms, inside of Baker's Island, Salem Harbor. (Number 26.)

b.—Another from 29 fathoms, off Marblehead. (Number 25.)

The temperatures of the water were taken at most of the localities examined. For the bottom temperatures two Miller-Cassella thermometers were usually employed simultaneously, and the readings of both are generally given in the following table. The great variations frequently observed in using these instruments is certainly very unsatisfactory, and tends to throw doubt upon all the deep-sea temperatures that have been taken by them, both in this country and by the English expeditions.* It is greatly to be regretted that some more reliable instrument cannot be obtained.

Fauna of the Muddy Bottoms.

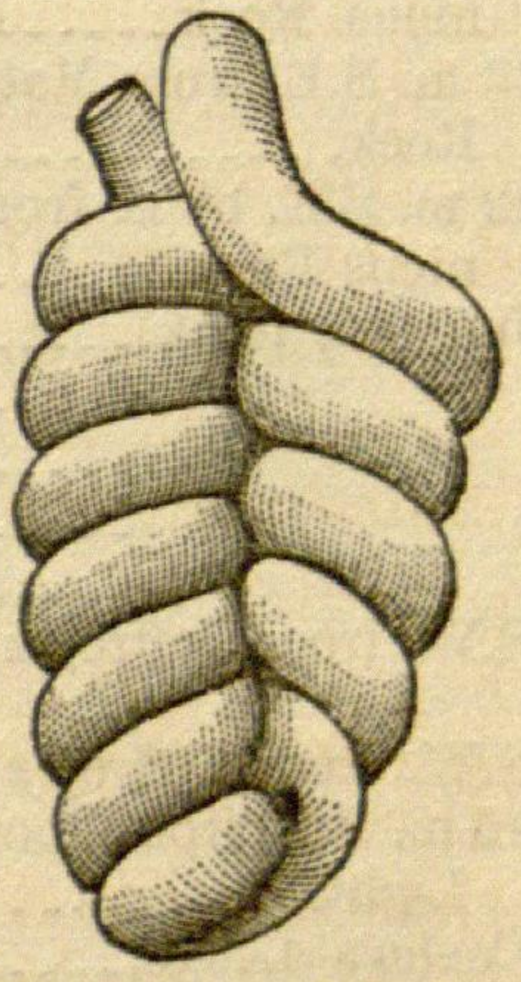
The collections dredged from the muddy bottoms examined during these cruises show a fauna essentially identical with that described in the previous papers of this series as obtained in 1872 by Messrs. Packard and Cooke, from muddy bottoms in 85 to 150 fathoms, near St. George's Bank, and likewise in the Gulf of Maine; and also with those dredged during the past season by our own party, off Casco Bay, from similar depths. The same fauna was also met with by our parties in the deeper parts of the Bay of Fundy, in 1868, 1870 and 1872; and also in the Gulf of St Lawrence by Mr. Whiteaves. Nevertheless, each different region explored presents some peculiarities, or at least affords species that have not yet been found in the other localities. Thus, during the past season neither of our parties have met with *Pennatula*, *Virgularia*, *Ringicula nitida*, *Pleurotomella Packardii*, *Solaster furcifer*, or several other interesting species obtained in 1872, from similar localities and depths. But on the other hand many equally interesting species have occurred this year that were not found

* We have observed not only that the different thermometers will often not agree within several degrees when used together, but the same instrument will not show the same amount of variation at different times, even under identical circumstances, when compared with a standard instrument.

before, and others that were previously rare have been found in abundance.

Among the most interesting Crustacea dredged on the muddy bottoms by Dr. Packard, at localities 36 and 37, are two specimens of a singular crab belonging to the genus *Geryon*, and allied to *G. tridens*, from the deep waters of northern Europe. Our species had been known before only by specimens taken from the stomachs of the fishes caught in deep water, off the coast of Maine. The large shrimp (*Pandalus borealis*) was dredged by Dr. P. in 114 fathoms (loc. 24), and by our party in 50 to 68 fathoms, off Casco Bay. A species of blind shrimp (*Pseudomma*) was dredged in 105 fathoms (loc. 13). This genus was before unknown on our coast, though Mr. Whiteaves dredged a species during the past season in the Gulf of St. Lawrence. *Epimeria cornigera* and *Stegocephalus ampulla* are rare arctic amphipods; and the former was previously unknown on our coast. The curious little barnacle, *Scalpellum Stroëmi* Sars,* had been dredged previously on our coast only by Mr. Smith in 1872, in 430 fathoms, off St. George's Bank, but Dr. Packard found a number of good specimens adhering to hydroids, etc., in 52 to 70 fathoms, near Cashe's Ledge (loc. 21), and also in 142 fathoms (loc. 36). This species likewise occurs only in deep water on the northern coasts of Europe.

1.



Among the Annelids of special interest are *Nychia Amondseni* Malmgren, dredged in 106 fathoms (loc. 18); and *Leanira tetragona* Malm., from 107 fathoms (loc. 9); both new to the American side of the Atlantic; *Grymæa spiralis* V.† (fig. 1, and plate v, fig. 4) and *Enipo gracilis* V.‡ (plate vi, fig. 4) are

* Dr. G. O. Sars has kindly compared a drawing of this species, sent by Mr. Smith, with European specimens, and states that they agree perfectly.

† *Grymæa spiralis* Verrill, sp. nov. (fig. 1, and plate v, fig 4.)

Body long and slender, spirally coiled, composed of over 150 segments, of which about 120 bear fascicles of slender setæ. Branchiæ long filiform, two or three times the diameter of body, arising in three clusters on each side, easily detached and often partially absent. Setæ on the first six or seven segments a little longer than the following ones. General color dark red. Tube (fig. 1) composed of firmly cemented mud and sand, coiled in a double spiral, the two halves revolving in opposite directions.

Off Casco Bay, in 90 fathoms, mud; off Grand Menan I., 60 fathoms; Jeffrey's Bank, 80 fathoms.

‡ *Enipo gracilis* Verrill, sp. nov. (plate vi, fig. 4.)

Body long and slender, quite narrow, the anterior part of the back only partially covered by small oval, smooth, translucent scales. Head rather elongated, tapering; eyes four, conspicuous. Setæ of the lower rami stout, with the terminal portion broad, short cuspidate, and armed with oblique rows of strong, sharp, ascending unequal spines; tips naked, acute, mostly curved.

Casco Bay, 15 to 20 fathoms; Jeffrey's Bank, 80 fathoms.

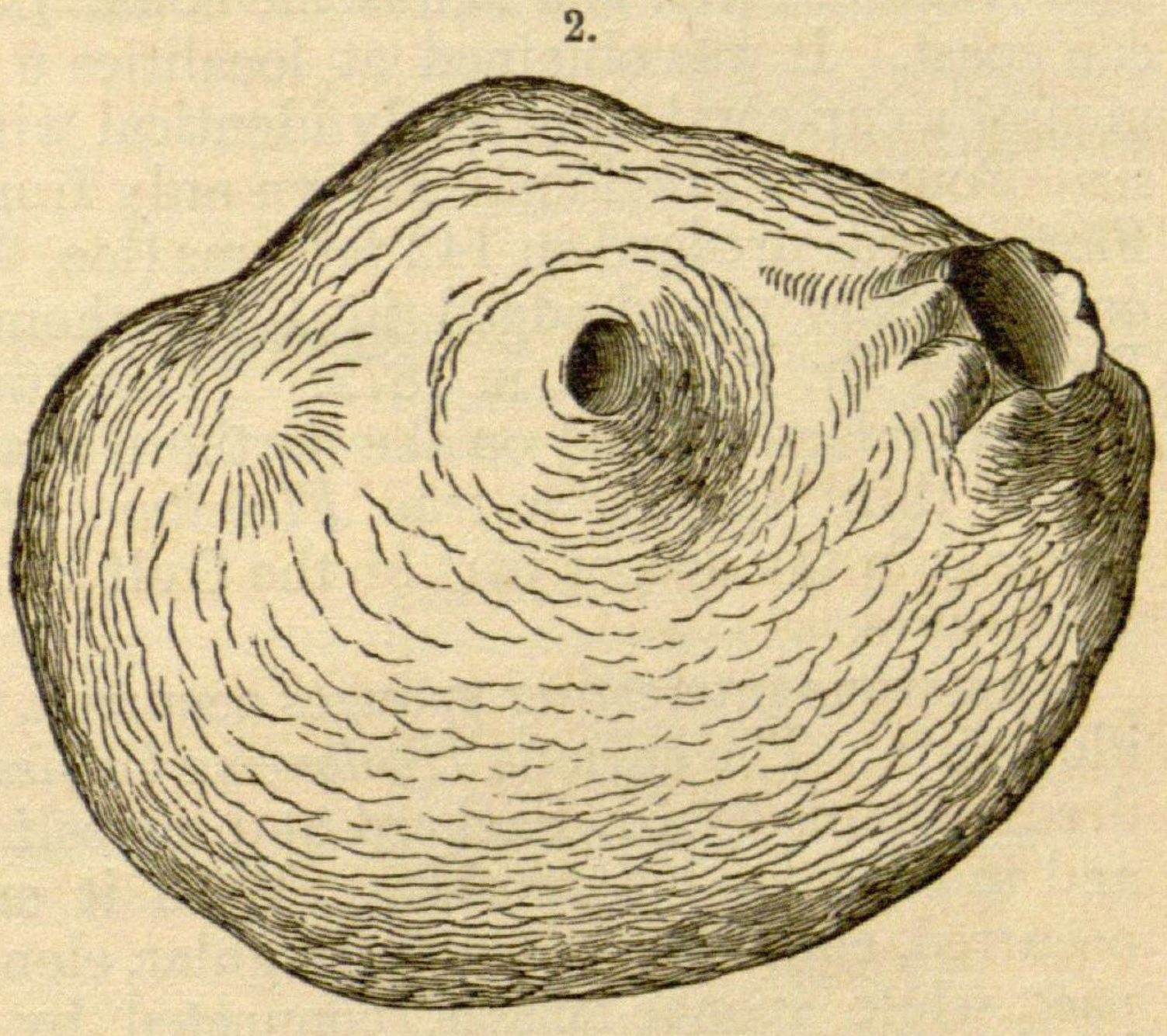
two new species, both from 80 fathoms (loc. 16), and also from Casco Bay. The *Nothria opalina* V. (plate IV, fig. 1) was very abundant on nearly all the soft muddy bottoms, from 50 to 142 fathoms; *Ninoë nigripes* V. (plate IV, fig. 3), *Lumbriconereis fragilis* (plate IV, fig. 2), *Pista cristata* (plate V, fig. 3), and *Chætoderma nitidulum*, were frequently met with.

No.	Locality.	Latitude.	Long.	Nature of bottom.	Depth in fathoms.	Temperature.		
						Air.	Surface.	Bottom.
1	Off Manheigan Island,			Soft gray mud,	52	58° F.	55°	42 & 44
2	7 m. S.W. from Manheigan I.	43° 39′	69° 22′	Soft mud,	--	58	55	42·5
3	8 m. S. from Manheigan I.,	43 38	69 17	Mud and sand,	64	56	54	43 & 44
4	13 m. S.E. by S. from Manheigan Island,	43 37	69 05	Br'n mud & sand,	60	60	55	43·5 & 45·5
5	17 m. S.E. from Manheigan I.	43 37	68 59	Brown mud,	72	60	54	43 & 44
6	15 m. S.E. from Manheigan I.	43 38	69 01	" "	82	--	--	
7	15 m. S.E. from Manheigan I.	43 38	69 01	" "	82	--	--	
8	18 m. S.E. by S. from Matinicus Rock	43 36	68 32	Mud & gravel,	94	56	55	
9	23 m. S.E. from Matinicus Rock,	43 36	68 24	Sticky br'n mud,	107	56	57	39·5 & 39·5
10	22 m. S.E. by S. from Matinicus Rock,	43 34	68 27	Soft br. mud,	104	56	57	40 & 41
12	Jeffrey's Bank,	43 20	68 33	Brown mud,	60	56	54	42
13	" "	43 23	68 30	" "	105½	58	54	40
14	" "	43 25½	68 40	" "	80	62	60	43
15	" "	43 23	68 44	" "	72½	60	58	42·5 & 47
16	" "	43 19	68 49	" "	79	62	58	40·5
17	S.W. from Jeffrey's Bank,	43 15 5	68 54	Brown mud with gravel,	100	59	57	52
18	S.W. from Jeffrey's Bank,	43 15 5	69 06	Brown mud,	106	58	56	40
20	15 m. S.E. from Boon Island Light,	43 1	70 10	Mud,	95	58	58	37·5 & 40·5
21	Cashe's Ledge,	42 49	68 50	Rocky,	52–90	52	57	43
22	56 m. E. of Cape Ann,	42 52	69 23	Blue mud,	90	52	56	40 & 43
23	47 m. E. of Cape Ann,	42 52	69 35	Mud,	118	54	57	39
24	E. of Jeffrey's Ledge,	42 56	70 09	Soft mud,	114	59	57	39
24*a*	6 m. farther west,	----	---	-------	114	58	58	36·5 & 40
25	3½ m. S.E. from Half-way Rock,	----	---	-------	29	--	54	43·5
26	Salem Harbor,	----	---	-------	6	--	--	
27	Jeffrey's Ledge, 6 miles east of Thatcher's Island Light,	----	---	Gravel & st's,	24	57	58	46
28	8 m. E. by N. of Thatcher's Island Light,	----	---	" "	26	57	58	48
29	14 m. N.E. by E. ¼ E. from Thatcher's Island Light,	----	---	" "	33	70	54	46 & 49
30	Massachusetts Bay,	42 26	70 35	Soft mud,	50	60	58	42 & 45
31	" "	42 19	70 29	Mud,	56	62	60	41·5 & 44
32	Stellwagen's Bank,	42 19	70 23	Hard, rocky,	29	64	58	48·5 & 50·5
33	" "	42 20	70 18	" "	22	64	--	48·5 & 50·5
34	" "	42 22	70 11	Sand,	44½	61	--	41·5 & 44
35	" "	42 08	70 15	"	34	59	57	48 & 50
36	20 m. E. from Cape Race,	42 18	69 49	Soft blue mud,	142	60	58	39 & 42
37	Off Massachusetts Bay,	42 20	70 00	" " "	117	--		

Among the Mollusks are several very interesting species, some of them new to the fauna of our coast; *Anachis Haliæeti* (Jeff. sp.) occurred in 114 fathoms (loc. 24), but was found in greater numbers on Cashe's Ledge (loc. 21), where several fine specimens were dredged; *Siphonodentalium vitreum* occurred sparingly at several localities in 60 to 107 fathoms; *Lasæa rubra* was only once met with (loc. 36), in 142 fathoms; *Crenella decussata* was less frequent than in our dredgings off Casco Bay; *Dacrydium vitreum* occurred sparingly several times in 60 to 142 fathoms (loc. 12, 9, 36), and also in our dredgings off Casco Bay, in 95 fathoms. These five shells are all new additions made this season to the fauna of the United States, and the *Anachis* and *Lasæa* have not been found previously on this side of the Atlantic, so far as known to me: the others have recently been dredged in the Gulf of St. Lawrence by Mr. Whiteaves.

Among the Tunicates were several fine specimens of *Glandula fibrosa* Stimpson, and also an apparently undescribed species of *Ascidia** (fig. 2), remarkable for its soft and rather flabby integument. Both these species occurred also in our dredgings off Casco Bay; the latter in great abundance in several localities, attached to scattered boulders.

2.



Among the Echinoderms there are several interesting Holothurians: the rare *Stereoderma unisemita* occurred in 142 fathoms (loc. 36); several large specimens of *Molpadia oölitica* were obtained in 95 fathoms (loc. 20); and one specimen of *Oligotrochus vitreus* Sars occurred in 60 and 105 fathoms (loc. 12 and 13). The last named species had been known before only from the deep

* *Ascidia mollis* Verrill, sp. nov. Figure 1.

Body large, hemispherical or subglobular, attached obliquely by the left side; integument rather thin, soft, and somewhat translucent, with the surface nearly smooth, but more or less wrinkled. Color, pale olive-green. Branchial aperture near one end, large, slightly elevated, surrounded by eight obtusely rounded lobes; anal orifice placed to one side of the middle of the body, little elevated, relatively small, rounded in ordinary expansion. Diameter of body usually one to two inches.

Common in 48 to 107 fathoms, attached to boulders in many localities off Casco Bay, off Manheigan I., at Jeffrey's Bank, Cashe's Ledge, etc.

waters off the Norwegian coast. It is remarkable for the beautiful and complex wheel-shaped plates scattered in its integument.

Schizaster fragilis was dredged at various localities, and is a common and characteristic species of these muddy bottoms; *Archaster arcticus* did not occur this season on the muddy bottoms, but several good specimens were obtained in 52 to 90 fathoms, on hard bottoms, near Cashe's Ledge (loc. 21), in company with *A. Parelii*, *Hippasteria phrygiana*, and other interesting species. *Ctenodiscus crispatus* was everywhere abundant. Several large and fine specimens of a peculiar Ophiuran, new to the American coast, were dredged in 142 and 117 fathoms (loc. 36 and 37). It agrees well with *Amphiura Otteri* Ljungman, which was dredged in 550 fathoms off the coast of Portugal by the Josephine Expedition. The *Ophioscolex glacialis*, from loc. 10, and *Amphipholis tenuispina*, from 105 fathoms (loc. 13), are other additions to our fauna. The former was also dredged in the Gulf of St. Lawrence last summer by Mr. Whiteaves. The *Antedon Sarsii* is a handsome comatula, new to the American coast. It was obtained at localities 6 and 21. One specimen of a cup-coral, apparently identical with *Deltocyathus Agassizii* Pourtales, previously known only from the deep water off Florida, was dredged in 142 fathoms (loc. 36). The *Ulocyathus arcticus* Sars was dredged in 150 fathoms, near St. George's Bank, by Dr. Packard, in 1872. These two species are the only stony corals yet found on the northern coast of New England; but a third species, a true *Flabellum*, of large size, has been dredged in the deeper part of the Gulf of St. Lawrence by Mr. Whiteaves.

Numerous interesting sponges occurred, which have not been identified. The curious *Hyalonema longissimum* G. O. Sars was dredged both by Dr. Packard and myself at several localities and in considerable numbers. With it an allied species often occurred, consisting of small irregular, elongated, fusiform, compact, white sponge-masses, connected by capillary stolon-like stems, made up of slender spicules twisted together. This species creeps over the bottom, but does not stand erect, like the former.

List of Species from the Gulf of Maine, inhabiting muddy bottoms, in 60 *to* 150 *fathoms.*

In the following list the species with an asterisk (*) prefixed belong more properly to the hard bottoms, but occur more or less frequently on the muddy bottoms, adhering to scattered stones, or among broken shells. Those with a dagger (†) were not obtained by Dr. Packard this season, but were mostly dredged in 1872, in the mouth of the Bay of Fundy, or near St. George's Bank; or else off Casco Bay during the past season.

The figures affixed to the names give, in fathoms, the greatest depths at which the species have been dredged on the New England Coast.

ARTICULATA.

Pycnogonida.

Nymphon giganteum, 82.
*N. grossipes (?), 65.

Crustacea.

Geryon, sp., 142.
†Chionocœtes, sp.
*Hyas araneus, 72.
*H. coarctatus, 150.
*Eupagurus pubescens, 150.
*E. Kroyeri, 430.
*E. Bernhardus, 150.
*Hippolyte spina, 72.
*H. Fabricii, 64.
Pandalus borealis, 68, 114.
*P. annulicornis, 430.
†Sabinea septemcarinata, 68.
†Caridion Gordoni, 52, 110.
Thysanopoda, large sp., 142, 430.
T. neglecta?, 105.
Pseudomma, sp., 105.
Mysis, sp., 68.
Diastylis quadrispinosa, 68.
†Praniza cerina, 68.
Asellodes alta, 90.
†Ægа psora, 150.
†Conilera polita, 150.
Anthura brachiata, 110.
*Paramphithoë pulchella, 142.
Harpina fusiformis, 110.
Stegocephalus ampulla, 72, 110.
Epimeria cornigera, 106.
*Melita dentata, 430.
Melita, sp.
Haploops, sp., 105, 114.
Ampelisca, sp., 142.
Ptilocheirus pinguis, 150.
*Unciola irrorata, 430.
†Dulichia, sp., 60.
*Caprella, sp. with spines, 142.
*Scalpellum Stroëmi Sars, 90, 142, 430.
*Balanus porcatus, 150.

Annelida.

Aphrodita aculeata, 72, 90.
Lætmonice filicornis ?, 150.
*Eunoa Œrstedii, 72.
*Harmothoë imbricata, 64.
Nychia Amondseni, 106.
†Antinoë Sarsii, 110.
Enipo gracilis V., 80.
†Pholoë minuta, 68.
Leanira tetragona, 107.
Nephthys ingens, 142.
N. ciliata, 114.
Phyllodoce, sp., 110.
*P. Grœnlandica, 90.
Eteone depressa, 110.
*Nereis pelagica, 142.
Nereis, sp. 68.
†Gattiola, sp. 68, 90.
*Leodice vivida, 430.
Nothria opalina, 150.
*N. conchylega, 430.
Ninoë nigripes, 114.
Lumbriconereis fragilis, 430.
Goniada maculata, 150.
Rhynchobolus albus, 110.
†Eumenia crassa, 110.
Scalibregma inflatum, 150.
*Travisia, sp., 95, 106.
Brada, sp., 90.
Tecturella flaccida, 90.
Trophonia aspera, 150.
Ophelia, sp., 107.
Ammotrypane fimbriata, 114.
Sternaspis fossor, 142.
†Scolecolepis cirrata, 150.
†Anthostoma acutum V., 64.
Chætozone setosa, 106.
†* Dodecacerea concharum, 90.
Maldane Sarsii, 150
Praxilla gracilis, 114.
P. prætermissa, 114.
*Nicomache lumbricalis, 110.
Ammochares, sp., 142.
†Notomastus latericeus, 110.
Arenia, sp. in capillary tubes, 117.
*Cistenides granulatus, 90.
Ampharete gracilis, 106.
†A. Finmarchica, 110.
Amphicteis Gunneri, 110.
Amage auricula, 150.
Samytha sexcirrata, 110.
Melinna cristata, 150.
†Samythella elongata V., 110.
Terebellides Stroëmi, 142.
Pista cristata, 150.
Grymæa spiralis V., 95.
*Thelepus cincinnatus, 142.
*Amphitrite cirrata, 95.
†A. Johnstoni, 64.
†A. Grœnlandica, 68.
Polycirrus, sp., 110.

*Potamilla oculifera, 90.
Sabella zonalis, 107.
Chone, sp., 95.
Euchone, sp., 106.
Myxicola Steenstrupii, 72.
*Protula media, 90.
*Vermilia serrula, 106.
*Spirorbis lucidus, 114.
†Ichthyobdella, (on Raia lævis) 68.

Gephyrea.

*Phascolosoma boreale (?), 64, 90.
P. cæmentarium, 430.
P. tubicola, 110.
Priapulus, sp., 60.
Chætoderma nitidulum, 110.
†Thalassema, sp., 90.

Turbellaria.

Nemertes affinis, 110.
Meckelia lurida V., 110.
†Macronemertes gigantea V., 68.
†Ophionemertes agilis V., 90.

MOLLUSCA.

Cephalopoda.

†Octopus Bairdii V., 106.

Gastropoda.

†Pleurotomella Packardii V., 110.
Bela decussata, 64.
B. cancellata, 430.
B. pleurotomaria, 107.
B. turricula, 117.
Admete viridula, 150.
Neptunea curta, 68.
N. decemcostata, 107.
Neptunella pygmæa, 430.
Buccinum undatum, 52.
*Anachis Haliæeti, 114.
†Ringicula nitida V., 110, 150.
Natica clausa, 430.
Lunatia Grœnlandica, 430.
L. immaculata, 430.
*Torellia vestita, 90, 150.
*Trichotropis borealis, 80.
*Velutina zonata, 150.
*V. lævigata, 110.
Aporrhais occidentalis, 150.
Turritella erosa, 106.
Scalaria Grœnlandica, 85.
Rissoa exarata, 95.
*Margarita obscura, 430.
*M. cinerea, 150.
*Calliostoma occidentale, 82.
*Diadora noachina, 430.
*Lepeta cæca, 110.
Scaphander puncto-striata, 150.
Cylichna alba, 150.
Utriculus pertenuis, 114.
Philine quadrata, 110.
P. lineolata, 64.
*Doris planulata, 142.
*Trachydermon albus, 150.
†Stimpsoniella Emersonii, 60.
†*Hanleia mendicaria, 80.
Dentalium occidentale, 150.
Entalis striolata, 150.
†E. agilis ?, 95.
Siphonodentalium vitreum, 107.

Lamellibranchiata.

†*Zirphæa crispata, 80.
Mya arenaria (young), 64.
Neæra arctica, 150.
N. pellucida, 142.
*Saxicava arctica, 114.
Panopæa Norvegica, 114, 118.
Thracia myopsis, 150.
T. truncata.
Periploma papyracea, 109.
Macoma sabulosa, 142.
Cyprina Islandica, 72.
Cardium pinnulatum, 150.
C. Islandicum, 117.
Cryptodon Gouldii, 110.
C. obesus, 430.
Lucina filosa, 142.
Lasæa rubra, 142.
Astarte lens, 430.
A. undata, 117.
A. quadrans, 150.
Cyclocardia borealis, 107.
C. Novangliæ, 90.
Nucula tenuis, 142.
N. proxima, 60.
N. delphinodonta, 68.
Leda tenuisulcata, 150.
Yoldia obesa, 150.
Y. thraciformis, 142.
Y. sapotilla, 117.
*Arca pectunculoides, 150.
*Modiolaria nigra, 107.
*M. discors, 90.
M. corrugata, 105.
Crenella glandula, 110.
C. decussata, 60.
Dacrydium vitreum, 95, 107, 142.
*Pecten Islandicus, 114.
†P. pustulosus, 430.
*P. tenuicostatus, 110.
*Anomia aculeata, 150.

Tunicata.

*Ascidia mollis V., 107.
*Ascidiopsis complanatus, 110.
*Ciona tenella, 64.
Molgula pannosa.
*M. retortiformis, 68.
Eugyra pilularis, 105, 114.
Glandula fibrosa, 95, 106.
*G. arenicola, 150.
*Cynthia echinata, 64, 80.
*C. carnea, 64, 80.
*Botryllus, sp., 64.
*Amarœcium glabrum, 64.
*Leptoclinum albidum, 72.

Brachiopoda.

*Terebratulina septentrionalis, 150.

Polyzoa.

*Crisia eburnea, 117.
*Hornera lichenoides, 150.
*†Discoporella verrucaria, 150.
*Idmonea pruinosa, 118.
*Discofascigera lucernaria, 110.
*Flustra solida St., 64.
*Membranipora pilosa, 64.
Gemellaria loricata, 142.
*Cellularia ternata, 150.
*C. scabra, 95.
C. Peachii (?), 150.
Bugula, soft sp., 95, 430.
*B. fastigiata, 150.
Bugula Murrayana, 430.
Caberea Ellisii, 150.
*†Anarthropora borealis, 150.
*Cellepora scabra, 150.
*C. ramulosa, var., 150.
*†Alcyonidium, sp., 64.

RADIATA.

Echinodermata.

*†Lophothuria Fabricii, 110.
*Psolus phantapus, 72.
†*Pentacta assimilis, 95, 430.
†Thyone scabra V., 110, 150.
Stereoderma unisemita, 142.
*†Thyonidium productum, 80.
Molpadia oölitica, 95.
Oligotrochus vitreus, 105.
Schizaster fragilis, 430.
*Echinarachnius parma, 430.
*Strongylocentrotus Dröbachiensis, 430
*Leptasterias compta, 90.
*L. tenera, 65, 142.
†Solaster furcifer, 150.
*Cribrella sanguinolenta, 90.
*Hippasteria phrygiana, 60, 90.
*†Archaster arcticus, 90, 150.
Ctenodiscus crispatus, 114.
Ophioglypha Sarsii, 430.
O. robusta, 118.
O. affinis, 105, 118, 150.
Amphiura Otteri, 117, 142.
*Amphipholis elegans, 105.
A. tenuispina, 105.
*Ophiopholis aculeata, 104.
Ophiacantha spinulosa, 150.
Ophioscolex glacialis, 104.
†*Astrophyton Agassizii, 90.
*Antedon Sarsii, 82.

Acalephæ.

†*Campanularia verticillata, 430.
†*Calycella producta G. O. Sars, 430.
C. plicatilis (Sars sp.), 97.
*Sertularia cupressina, 150.
*Sertularella polyzonias, robust var., 142.
†*S. geniculata Hincks, 430.
*S. tricuspidata, 430.
*Lafoëa gracillima, 430.
†*Halecium robustum V., 430
*Eudendrium ramosum, 430.
*Tubularia indivisa, 430.
Corymorpha pendula, 95.

Anthozoa.

†Virgularia Lyungmanii, 150.
†Pennatula aculeata, 110, 150.
†*Cornulariella modesta V., 106.
*Urticina nodosa (Fab. sp.), 430.
*U. crassicornis, 430.
*Bolocera Tuediæ, 150.
Edwardsia farinacea V., 95.
E. sipunculoides, 106.
†Ilyanthus levis V., 60.
Cerianthus borealis V., 150.
†*Epizoanthus Americanus, 430.
Deltocyathus Agassizii, 142.
†Ulocyathus arcticus, 150.

Hyalonema longissimum, 95.
*Polymastia, sp., 117.

Spongiæ.

*†Phakerellia ventilabrum, 68.
*Reniera, soft sp., etc.

Explanation of Plates.

Plate IV.—Figure 1, *Nothria opalina* V.; head and anterior part of body.
Figure 2, *Lumbriconereis fragilis;* head and anterior part of body.
Figure 3, *Ninoë nigripes* V.; one of the appendages from the middle part of body.
Figure 4, *Nephthys ciliata;* one of the appendages.
Figure 5, *Phyllodoce catenula* V.; head, anterior part of body, and proboscis.
Figure 6, *Stephanosyllis picta* V.; head, anterior part of body, and caudal segments.

Plate V.—Figure 1, *Procerea gracilis* V.; head and anterior part of body.
Figure 2, *Eulalia pistacia* V.; anterior and posterior portions.
Figure 3, *Pista cristata* M.; head and anterior part of body.
Figure 4, *Grymæa spiralis* V.; head and anterior part of body.

All the figures were drawn from nature by Mr. J. H. Emerton, except fig. 4, plate IV, which was copied from Ehlers; all are much enlarged.

SCIENTIFIC INTELLIGENCE.

I. Chemistry and Physics.

1. *On the Variations of Chemical Activity in the Solar Spectrum and on an Apparatus for their measurement.*—In his spectro-photographic researches, Vogel has sought to determine, not only the absorbing action of various colored media, but also the chemical action exerted by the sun-spectrum upon pure silver bromide. Finding it impossible to get correspondent results, even under apparently identical conditions, he was at first led to attribute the variations to differences of delicacy in the plates employed. Sometimes the action extended more into the violet or ultra-violet, sometimes more into the yellow and red. Exact experiments with different plates, exposed at the same time in a camera having two similar objectives, proved these variations in delicacy to be insignificant in comparison with the results; and hence proved that changes took place in the relative intensity of the spectrum colors themselves. Now it is well-known that, as the sun nears the horizon, the luminous intensity of the violet diminishes much more rapidly than that of the red. Bunsen and Roscoe have proved that the chemical activity of the spectrum rays also varies, since these are absorbed differently by the atmosphere at different periods of the day. But precisely what these variations are throughout the whole spectrum, it has been reserved for the silver-bromide plate to show. Vogel gives the results of his experiments in a table in which the day (and time of day), the sun's height, the time of exposure and the state of the barometer and psychrometer, are given. On the 7th of October, at 2 P. M. the photographic activity of the spectrum extended from a point midway between C and D to considerably beyond H. On the 17th, at 2.30, it reached from a point short of D to a point nearly to H′. On the 18th, from a point midway between C and D, to a point considerably short of H. On the 29th, from beyond B to a